Primary Stroke Education Using the ASCVD Risk Calculator and the Stroke Knowledge Test in Primary Care

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Abstract

The incidence of stroke is expected to rise with the aging population, and the healthcare cost is predicted to triple by 2030. Stroke, as the leading cause of disability, warrants a stroke prevention education program in a primary care setting to provide quality healthcare. The purpose of the quality improvement project is to increase awareness of stroke risk factors and symptoms within a primary care setting. The increased awareness will contribute to preventing devastating stroke outcomes. A quality improvement project with a quasi-experimental, single group, pre, and posttest design, implemented a stroke prevention education at a small Midwest family practice clinic. The participants received stroke prevention education using educational materials from the Center for Disease Control and Prevention, and the Atherosclerotic Cardiovascular Disease risk calculator estimated the ten-year risk of having a cardiovascular event. The Stroke Knowledge Test assessed the effectiveness of the educational intervention on stroke knowledge. Implementation of the intervention was conducted from September 2019 to February 2020. Of the 25 participants, 68% were female, 88.5% were Caucasian, and 68% completed high school. Stroke knowledge statistically increased from pre to posttest ($p < 0.001$). The educational intervention was successful at increasing stroke knowledge. The impact on healthcare is to increase primary prevention strategies for stroke in a family practice. Further intention is to decrease the incidence and disability from stroke.

Keywords: stroke education, stroke prevention, stroke risk factors, ASCVD Risk Calculator, primary care, and family care

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Cerebral vascular accidents are the leading cause of devastating disability in the United States (Mozaffarian et al., 2016). Through the management of chronic diseases, such as hyperlipidemia, hypertension, and diabetes mellitus, strokes can be prevented (An et al., 2018; Gorelick et al., 2015; Marvanova & Henkel, 2019). Cardiovascular disease increases the risk of vascular events (Meschia et al., 2014). Among the general public, knowledge deficits are present when identifying stroke risk factors and symptoms, and time is limited to adequately educate patients on their risk in primary care settings (Gutiérrez-Jiménez et al., 2011). Individuals need to know the symptoms of a stroke and when to activate the emergency medical service. The significance of seeking medical treatment promptly for stroke is to prevent neurological damage (Marvanova & Henkel, 2019). Educational interventions are indicated within primary care settings to increase awareness of stroke risk factors and stroke knowledge among the general population (An et al., 2018).

Significance

The most common occurring stroke is an ischemic stroke at 87%, followed by intracerebral hemorrhage and subarachnoid hemorrhage at 10% and 3%, respectively (Mozaffarian et al., 2016). The incidence of stroke rapidly increases after the age of 55 and more than half of strokes occur after the age of 65 (Marvanova & Henkel, 2019). The United States spends most of the healthcare dollars on chronic diseases, including cardiovascular disease (Gorelick et al., 2015). It is estimated the yearly healthcare cost, medications, and days of work missed related to stroke is $34 billion (Boehme et al., 2017). Approximately $17.2 billion were

spent in the healthcare system on stroke from 2011-2012. The cost of the health care system associated with stroke is expected to triple by 2030 (Mozaffarian et al., 2016).

Issues identified in primary care are limited time during regularly scheduled appointments for extensive education (Marvanova & Henkel, 2019) and under prescribing of prevention medications (Turner et al., 2016). Turner et al. (2016) found anticoagulation and statin medications were under prescribed. Six out of ten first-time stroke patients were eligible for at least one prevention medication, and less than half of the patients were prescribed the medication. It was estimated that 12,000 strokes could have been prevented with the proper medications to manage stroke risk factors in the primary care setting annually, demonstrating the necessity of risk factor management (Turner et al., 2016).

Local Issue

In the small Midwest community where the project was conducted, 76.4 per 100,000 deaths from strokes occurred between 2014-2016. The national rate of stroke hospitalizations between 2014-2016 was 22.5 per 1,000 for Medicare beneficiaries over the age of 65. The rate of stroke hospitalizations for the county where the project was conducted was 25.7 per 1,000 between 2014-2016. Blood pressure medication nonadherence is 25.5% (Center for Disease Control and Prevention [CDC], n.d.). The rate of a sedentary lifestyle in the county is increased (CDC, n.d.) and 80% were unable to identify stroke signs and symptoms (Missouri Department of Health and Senior Services, n.d.). The county where the project occurred has an 11% poverty level, the average household income is $57,600, and the highest-grade level of *less than college* completed is 85.6% (CDC, n.d.).

Diversity Considerations

The project setting was in a rural Midwest community. The primary clinic accepts most insurances and serves patients of all ages. The total population was 5,797 in 2010 (Census Viewer, n.d.). The ethnicity of the county population is 93.67% Caucasian, 3.16% African American, 2.09% Hispanic, and less than 1% is Native American, Asian, or Hawaiian, Pacific native (Census Viewer, n.d.). Population by ages from the 2010 census was 0-4 years at 7.31%, 5-17 at 15.92%, 18-64 at 58.55%, and 65 and older at 18.22% (Census Viewer, n.d.). The average household income ranges from $50,400-80,700, the average unemployment rate is 4%, and 10.9% of the population does not have health insurance (CDC, n.d.). Older patients rely on the clinic to provide complete care, if possible, due to limited travel abilities to larger cities. At the local hospital, patients may have the opportunity to have appointments with specialists that travel to the area for care. The resources at the hospital assist in overcoming the travel barrier for many patients. Non-emergent transport services are available to those with disabilities.

Problem Statement

When identifying stroke risk factors and symptoms, a knowledge gap is present for many individuals currently diagnosed with chronic conditions recognized as stroke risk factors (Marvanova & Henkel, 2019). It is estimated that 80% of strokes are preventable with adequate management of risk factors (An et al., 2018; Sullivan et al., 2008). Interviews completed with primary care physicians felt they were unable to provide each patient with proper education on stroke risk factors due to time constraints during regular 15-minute appointments (Williams et al., 2016). The aim of the project was to implement quick stroke education intervention to be completed with patients during their 15-minute appointments.

Intended Improvement

The intended outcome was to increase stroke awareness, promote the importance of managing stroke risk factors, and foster identification of stroke symptoms by utilizing the Atherosclerotic Cardiovascular Disease (ASCVD) risk calculator as an education tool. The ASCVD risk calculator is specifically for primary prevention and it is simple to use. It gives patients and providers objective data on medications and lifestyle modifications to reduce cardiovascular and stroke risk in ten years.

Purpose Statement

Patients at risk for stroke have an insufficient understanding and awareness of their stroke risk factors. Controlling stroke risk factors by increasing stroke knowledge via an educational intervention in primary care contributes to better control of chronic conditions recognized as stroke risk factors (Galloway & Lakin, 2017). The primary purpose of the project was to increase stroke awareness through use of the ASCVD in patient education.

Facilitators and Barriers

The facilitators of the project included the preceptors and mentors of the student investigator. Clinic staff, including the providers, the office manager, and nurses, were also facilitators. The project cost was estimated to be low (See Appendix A, Cost Table). The project required minimal equipment. Low cost and the benefit of identifying and managing stroke risk factors served as a facilitator for the project. Barriers of the project included time constraints of the patients and the providers, unwillingness of patients to participate, and lack of a patient lipid panel before the educational intervention, limiting the use of the ASCVD risk calculator.

Review of Evidence

Inquiry

In adult patients over the age of 30, does a stroke education program on lifestyle modifications and stroke risk using the Atherosclerotic Cardiovascular Disease (ASCVD) risk calculator and the Stroke Knowledge Test improve stroke knowledge over six-months at a family clinic?

Search Strategies

The literature search included multiple search engines and databases, such as CINAHL, Ovid Medline, Google Scholar, Pubmed, and the American Heart Association journal. Keywords for the search were stroke education, stroke prevention, stroke risk factors, ASCVD risk calculator, primary care, and family care. Literature exclusion included articles published before January 2011, with a few exceptions, such as the Stroke Knowledge Test (SKT) that has pertinent stroke information related to the project (Sullivan & Dunton, 2004). All research designs were included (see Appendix B, PRISMA). A total of 77 studies were reviewed, with 22 matching the inclusion criteria. Studies were excluded if they did not address stroke risk factors, stroke education, or stroke knowledge.

Evaluating the levels of evidence for each study was based on Melnyk and Fineout-Overholt (2019) evidence levels for an interventional inquiry. The levels of evidence for the 22 studies were one level I evidence-based practice guideline, four level II randomized control trials, four level III quasi-experimental studies, five level VI quantitative studies, zero level V quantitative descriptive studies, four level VI qualitative studies, and four level VII integrative reviews (See Appendix C, Evidence Table).

Evidence Themes

Reviewing the literature revealed three themes of evidence: stroke risk factor management, stroke education, and stroke knowledge. Each evidence topic is critical to address

during an educational intervention due to the overlapping evidence. Gaining stroke knowledge relates to understanding stroke risk factors through stroke education.

Stroke Risk Factor Management

Eight articles focused on the number of individuals who were unable to identify stroke risk factors (Boehme et al., 2017; Bushnell et al., 2014; Gorelick et al., 2015; Gutiérrez-Jiménez et al., 2011; Meschia et al., 2014; Mozaffarian et al., 2016; Ovbiagele & Nguyen-huynh, 2011; Stroebele et al., 2011). Disease management may not be monitored closely by the patient when they are unaware of the risk of stroke (Gutiérrez-Jiménez et al., 2011). Risk factors must be recognized by the patient. Reducing stroke burden is dependent on the patient showing an initiative of self-managing the modifiable risk (Boehme et al., 2017; Holzemer et al., 2011). The two most basic types of stroke are ischemic and hemorrhagic. Risk factors for each type of stroke are similar but can be different, making identifying stroke risk factors challenging. Hypertension is notably a high-risk factor for a hemorrhagic stroke and may also lead to the formation of atherosclerosis, which can cause an ischemic stroke. Hyperlipidemia and atrial fibrillation are risk factors related to ischemic strokes, but are not necessarily high-risk for hemorrhagic strokes (Boehme et al., 2017).

Stroke risk factors are subcategorized into modifiable and non-modifiable risk. Modifiable risk factors include atrial fibrillation, hypertension, diabetes mellitus, hyperlipidemia, sedentary lifestyle, smoking, and an unhealthy diet (See Appendix D, Definition of Terms). Active cigarette smoking is estimated to increase the risk of stroke by 50%, and the percentage is increased when the patient is on hormonal replacement simultaneously (Holzemer et al., 2011; Marvanova & Henkel, 2019). The ultimate challenge for prevention strategies are individuals with several chronic conditions (Gorelick et al., 2015). Hypertension is a crucial modifiable risk

factor and has a direct relationship to stroke risk. Two-thirds of individuals older than 65 years of age are hypertensive. Blood pressure may be treated with medication and lifestyle modifications and is one of the most valuable preventions of stroke risk, but remains undertreated (Boehme et al., 2017). The Dietary Approaches to Stop Hypertension (DASH) diet is the diet recommended for patients with hypertension. The DASH diet includes a diet low in fat and cholesterol, and high in fiber and protein. It also recommends a sodium restriction of fewer than two grams. The diet focuses on lean meats and a variety of vegetables (Meschia et al., 2014). Another modifiable risk factor is poor medication adherence. Patients taking their medications 75% of the time had a four-fold increased risk of stroke, compared to those taking their medication 100% (Bushnell et al., 2014). If patients understand why they are taking the medication, it increases compliance with medication (Bushnell et al., 2014). Non-modifiable risk factors include genetics, age, ethnicity, and gender (Boehme et al., 2017; Meschia et al., 2014; Mozaffarian et al., 2016; Ovbiagele & Nguyen-huynh, 2011).

Risk factors for stroke are not always recognized or identified by patients. Lifestyle modifications and medications can control risk factors to decrease an individual's risk for stroke (Gutiérrez-Jiménez et al., 2011; Stroebele et al., 2011; Sundseth et al., 2014). Patients need proper knowledge to control and manage the risk of stroke. Educational interventions are necessary for primary care to educate and counsel patients at risk (Holzemer et al., 2011; Sundseth et al., 2014). Primary care providers are the main source for stroke prevention and need estimate the risk of a stroke (Boehme et al., 2017). One resource to measure risk is the ASCVD risk calculator, which estimates the 10-year risk of having a cardiovascular event or stroke (Gupta & Smith, 2014). Therefore, primary care providers need the tools to evaluate and educate patients on modifiable risk factor management (Turner et al., 2016).

Stroke Education

In the literature, different types of educational interventions included public-based, school-based, and family-based education. Mass media campaigns, surveys, videos, and classroom education interventions were used among the studies. Eight studies focusing on educational interventions were evaluated (Alberts, 2012; Amano et al., 2014; An et al., 2018; Holzemer et al., 2011; Marvanova & Henkel, 2019; Sullivan & Katajamaki, 2009; Thrift et al., 2014; Turner et al., 2016). The education intervention intends to increase the knowledge and understanding of stroke symptoms and the importance of seeking medical evaluation (Alberts, 2012; Amano et al., 2014; Marvanova & Henkel, 2019; Sullivan & Katajamaki, 2009). During an educational intervention, stroke risk factors and stroke symptoms are identified. The education focuses on how to manage and reduce the risk of stroke (Holzemer et al., 2011; Marvanova & Henkel, 2019). Educating patients on stroke risk factors and stroke symptoms is key to decreasing morbidity and mortality by the prevention of stroke (Marvanova & Henkel, 2019). Primary care providers may be overwhelmed with the education and information patients need in a short amount of time during their visits (Holzemer et al., 2011; Turner et al., 2016). Lack of knowledge of risk factors can negatively impact prevention strategies, and an inadequate understanding of stroke symptoms could delay treatment (Marvanova & Henkel, 2019). If patients are adequately educated on the importance of managing their risk factors, they may be more inclined to adhere to their medication regimen (Bushnell et al., 2014; Holzemer et al., 2011; Marvanova & Henkel, 2019; Thrift et al., 2014). Although education provides the patients with the tools to promote lifestyle changes, patients have to take the initiative in their healthcare to manage risk factors and prevent cardiovascular events (Marvanova & Henkel, 2019).

Other strategies for stroke education are including family members and students during an educational intervention. It is anticipated the family member or adolescent may be a witness or bystander to an individual suffering from a stroke and would activate the emergency medical system. Education for family members could prove beneficial, especially if they are caring for a loved one at risk for stroke (Amano et al., 2014; Sullivan & Katajamaki, 2009).

Stroke Knowledge

Among the population, individuals lack stroke knowledge, including recognizing stroke symptoms and stroke risk factors. When individuals are not able to recognize stroke symptoms, treatment is delayed, leading to an increased risk of permanent neurological damage. Stroke educational interventions can increase stroke knowledge and awareness (Alberts, 2012; Gutiérrez-Jiménez et al., 2011; Sundseth et al., 2014). Five studies acknowledged a decreased awareness of stroke symptoms and risk factors (Alberts, 2012; Dombrowski et al., 2013; Nishikawa et al., 2016; Sloma et al., 2010; Sundseth et al., 2014). Factors that have a negative impact on stroke knowledge include older age, living alone, males, and lower socioeconomic status (Sloma et al., 2010).

The *Act FAST* campaign has been widely used during educational interventions, including mass media interventions. Many individuals were able to recognize the campaign. However, few were able to identify stroke symptoms (Dombrowski et al., 2013; Sundseth et al., 2014). An increase in stroke knowledge was determined after a six-month educational program provided by medical students addressing stroke symptoms and risk factors (Gutiérrez-Jiménez et al., 2011). Dombrowski et al. (2013) interviewed stroke patients, stroke witnesses, and primary care providers on who would benefit from the *Act FAST* campaign. Participants verbalized awareness of the campaign and how it impacted response to a stroke emergency (Dombrowski et

al., 2013). Better prevention and medication compliance may occur with improved stroke knowledge, along with more individuals receiving immediate treatment if they develop stroke symptoms (Nishikawa et al., 2016; Sundseth et al., 2014).

Theory

The Adult Learning Theory is a cognitive learning theory. Cognitive theories focus on how the mind influences a person's actions, which became popular in the 1960s due to the limitations noted in the behavioral theories (McEwen & Wills, 2014). The Adult Learning model has essential aspects of teaching adults by having a comfortable environment, forming a mutual trust, respect, and accepting differences (Russell, 2006). Students are responsible for what they learn compared to adults, who need to understand why it is essential to learn and how it will affect their future quality of life. Verbalization is necessary during the educational intervention to assess the knowledge obtained by the adult learner (Russell, 2006). Adult learners need the proper motivation and learn better when their personal experiences are incorporated into the learning process. The motivation for an adult to learn is derived from wanting to solve immediate problems (McEwen & Wills, 2014). The concepts presented in the Adult Learning Model are the processes of learning, comfort, mutual trust, respect, openness, and acceptance of learning (McEwen & Wills, 2014).

The stroke education program benefited from utilizing the Adult Learning Theory (See Appendix E, Theory to Application Diagram). The theory identifies adults as problem solvers (Knowles, 1973). The stroke education program focused on stroke risk factors and stroke knowledge. The intervention utilized the participant's past experiences and their readiness to learn as resources for the program (Russell, 2006).

Methods

IRB Approval

The Institutional Review Board (IRB) through the University of Missouri-Kansas City deemed the project as a quality improvement project, not human subjects research (See Appendix F, IRB Approval Letter). The small family practice clinic agreed with conducting the project at their site.

Ethical Considerations

The participants were informed about the quality improvement project and offered participation in the project intervention. The patient's names were not recorded. However, demographics collected included age, gender, ethnicity, and the highest level of school completed. Each participant was assigned an identification (ID) number for comparing the pre and posttest results. The educational intervention was conducted in a private exam room to enhance privacy. The Health Insurance Portability and Accountability Act (HIPPA) guidelines were followed to protect patient information. Patients were not enrolled if they were unable to give a verbal agreement to participate. The student investigator had no conflicts of interest to disclose.

Setting and Participants

The project site was a small Midwest family clinic. The clinic treats patients throughout the lifespan and a range of diagnoses. According to the CDC, the rate of a sedentary lifestyle in the project site county is increased (n.d.), making an ideal setting for a stroke education intervention.

Consecutive sampling was used to enroll participants at the family clinic one day a week. The sample size was estimated at 28. Participants were eligible to join the project if they were 30

years old or older, spoke English, and with no prior history of stroke. Both men and women were eligible to participate.

Evidence-based Practice Intervention

The quality improvement project focused on identifying stroke risk factors for each participant, improving stroke education on symptoms, and promoting treatment. The providers and nurses at the family clinic were given the inclusion criteria for the project and identified eligible patients. The student investigator approached the eligible patient, initiated the discussion about the project, and obtained verbal agreement for participation (See Appendix G, Recruitment Materials). Next, the pre-SKT was completed by the patient. The student investigator reviewed the ASCVD risk calculator results and the pre-SKT results with the patient. The ASCVD risk calculator produced an estimation of a cardiovascular or stroke event over ten years.

When reviewing the ASCVD risk calculator results with the participant, the student investigator discussed lifestyle modifications to decrease the score. If the participant was a current cigarette smoker, reevaluating the score gave the patient objective data on how smoking cessation decreased their risk of a future cardiovascular or stroke event. Stroke education included “Know the Facts About Strokes” from the CDC website (CDC, 2019), which reviewed the significance of stroke, the different types of stroke, risk factors for stroke, stroke symptoms, and stroke treatments. It also lists additional educational websites for assistance with lifestyle modifications to prevent strokes and was given to the patient (CDC, 2019; See Appendix H, Educational Material). After the intervention and questions were answered, the patient completed the post SKT and finished with a short, three-question post-survey. The educational intervention lasted approximately 15 minutes in its entirety. The pre and post SKT were the most time-consuming component of the intervention. After the data was collected, the pre and post SKT

were compared (See Appendix I, Project Timeline Flow, and Appendix J, Intervention Flow Diagram).

Change Theory and Evidence-based Practice Model

The Transtheoretical Model of Health Behavior Change (TTM) was the change process theory used for the project. The model aligns with the project inquiry by explaining behavior change in patients. The TTM describes five different stages of change; pre-contemplation, contemplation, preparation, action, and maintenance (Levoy et al., 2019). During the educational intervention, patients received information on how to reduce their cardiovascular disease and stroke risk. The TTM allowed the student researcher to understand the stage of change of the participant and assisted them to advance to the next step in the model, maximizing the educational outcome.

The evidence-based practice model chosen for the project was the Iowa Model. The Iowa Model has a clearly outlined change process with feedback loops. The model starts by identifying a clinical question. The inquiry has an educational focus, which can be addressed by the Iowa Model. The model also offers step-by-step guidance to answer clinical questions based on the evidence and implement improvement into practice (Zhao et al., 2016).

Study Design

The project used a quasi-experimental design with a single group, pre, and posttest. The student investigator led the educational intervention. The primary outcome measurement was based on a pre and posttest evaluation. Participants needed for a medium effect size of 0.5, power of 0.80, and alpha 0.05 for a paired *t*-test is 28 (Faul, Erdfelder, Lang, & Buchner, 2007). The data collection phase of the project occurred over six months.

Validity

Possible threats to internal validity were identified. Using the same test for the pre and posttest could alter results due to repeating the test two times within a short period. Participants may have a better score the second time taking the test due to seeing the test previously, instead of the education providing the knowledge change. Each participant was given adequate time to complete the pre and post SKT, and the questions were presented in a different order on the post SKT to promote internal validity.

The intervention is transferable, and the project is generalizable to other family practice settings. The ASCVD risk calculator was re-developed due to concerns for generalizability. The updated calculator now takes into consideration race, diabetes, and other cardiovascular risk factors (Gupta & Smith, 2014).

Outcomes

The primary outcome measured was stroke knowledge, including stroke risk factors, by using the SKT. The results from the pre and posttest were compared. The intent was to increase the SKT score on the posttest due to the educational intervention (See Appendix K, Logic Model). Although not measured, a possible secondary outcome was increasing self-advocacy for participants in their healthcare.

Measurement Instrument

The SKT and the ASCVD risk calculator were the tools utilized for the stroke educational intervention (See Appendix L, Measurement Tools). The SKT validation by Sowtali, Yusoff, Harith, and Mohamed (2016) identified the test to have decent coverage of content, positive review ratings, and satisfactory item properties. The SKT was rated at a moderate level for reliability (Sowtali et al., 2016). The readability of the SKT was analyzed by Sullivan and Dunton (2004) and they concluded the SKT was at a standard reading level. Permission was

granted to use the SKT (See Appendix M, Permission for the use of Tool). The ASCVD risk calculator has been validated in the United States and shows the best correlation between observed and calculated cardiovascular risk, as compared to other similar tools (Grammer et al., 2019). The ASCVD risk calculator is available to the public and does not need permission for use.

Before the education portion of the intervention, each participant completed the SKT. Participants were provided with a private, quiet testing area. During the pretest, the student investigator calculated the cardiovascular risk using the ASCVD risk calculator. One-on-one education was conducted after the pretest in a private room. The participant finished the intervention by completing the posttest.

Quality of Data

The G*Power program was used to identify the number of participants desirable for a medium effect size of 0.5, alpha 0.05, and power is 0.8. The calculation indicated a participant size of 28 (Faul, Erdfelder, Lang, & Buchner, 2007). Pre and posttest data were collected from September 2019 to February 2020. Data was only collected one day a week due to the student investigator's schedule conflicts, limiting data collection.

The article by Sullivan and Katajamaki (2009) used the SKT to measure outcomes for the stroke educational intervention. Two groups were compared during the intervention, a high-risk, and a low-risk group. The low-risk group ages were 18-47, and in the high-risk group, ages ranged from 50-85. The low-risk group was recruited from a university, while the high-risk group was recruited from senior citizen centers. The pre-SKT was completed at the beginning of the intervention, and also consisted of reading pamphlets and participating in a discussion addressing stroke risk factors, stroke symptoms, and a transient ischemic attack information

sheet. Participants had ten minutes to read the printed material and then 30 minutes of discussion. The post SKT was taken immediately following the intervention and then one week later. The results from the education showed improvements in scores between baseline and the post-intervention test by five points in the low-risk group and three points in the high-risk group (Sullivan & Katajamaki, 2009).

Analysis Plan

The Statistical Package for the Social Sciences (SPSS) version 26 was utilized for data analysis. The statistical test for the pre and posttest data analysis of the SKT was a paired *t*-test (See Appendix N, Data Collection Template). The McNemar test was used to test for paired nominal data of the pre and posttest. Descriptive statistics reported demographic data and included age, gender, ethnicity, and highest level of school completed (See Appendix O, Statistical Analysis Tables). Each participant was assigned a record ID number to keep their identity private but allow for pre and posttest comparisons.

Results

Setting and Participants

The quality improvement project was conducted in a small family practice in Missouri, with the education intervention implemented from September 2019 to February 2020. Two providers and one nurse were involved in the recruitment of participants. Twenty-five adult patients over the age of 30 were enrolled using consecutive sampling one day a week. The age range for the study population was 30-79 years old (M=56.64, SD=15.989). The participants were 68% (n=17) female and 32% (n=8) male. The ethnicity of the participants was Caucasian at 88.5% (n=23), African American at 3.8% (n=1), and other at 3.8% (n=1). The highest level of school completed was high school at 68% (n=17), bachelor's degree at 16% (n=4), associate

degree at 4% (n=1), middle school at 4%(n=1), and other at 8% (n=2; See Appendix O, Statistical Analysis, Table 3).

Intervention Course, Actual

The two providers and one nurse of the clinic identified eligible participants. The nurse briefly asked if the patient was interested in speaking with the student investigator. Following the patient's scheduled appointment with the provider, the student investigator met with each individual privately to further discuss the intervention (Appendix G, Recruitment Materials). The participants who gave a verbal agreement completed the pre-SKT. Once completed, the student investigator reviewed the ASCVD risk calculator score and discussed results with the participant. The ASCVD risk calculator facilitated in identifying patients' risk factors. If medication recommendations were made from the ASCVD risk calculator, the student investigator discussed options with the provider. The provider and the patient decided if the medication was needed for treatment. The ASCVD risk calculator showed participants how medication and lifestyle modifications could decrease their cardiovascular and stroke risk. Utilizing the CDC's "Know the Facts About Strokes," the stroke risk factors, symptoms, and when to call 9-1-1 were reviewed with the participant (CDC, 2019). The student investigator answered questions throughout the intervention. The participant then completed the post SKT and a short post-intervention survey.

Outcome Data

The primary outcome of the quality improvement project was to increase stroke knowledge. Stroke knowledge statistically increased from pre (mean of 12 out of 20 points) to post (mean of 18 out of 20), $t(25)= -9.7$, $p < 0.001$ (See Appendix O, Statistical Analysis, Table 1). Eight of the twenty questions were found to be statistically significant ($p < 0.05$) when

comparing pre and posttest questions using the McNemar test. The questions addressed stroke risk factors, transient ischemic attack, and stroke symptoms (See Appendix O, Statistical Analysis, Table 2). On the pretest, 68% (n=17) of participants knew diabetes would increase the risk of stroke, compared to 96% (n=24) answered correctly on the posttest. On question number five, addressing transient ischemic attacks with symptoms disappearing in 24 hours, 16% (n=4) of participants answered correctly on the pretest and 100% (n=25) on the posttest. Questions addressing the most common type of stroke, warning signs of a stroke, purpose of rehabilitation, treatment options, obesity and hypertension as risk factors for stroke, and the importance of calling an ambulance immediately if stroke-like symptoms are present were not statistically significant ($p > 0.05$).

The ASCVD risk score could not be calculated for six participants due to no previous lipid panel documented in the electronic health record. The ASCVD risk score ranged from 0.2% to 59.8%, meaning a low to high 10-year risk of a cardiovascular event (M=13.2, SD=16.7).

Post intervention survey. After the intervention, participants were asked, *"Did you find this educational intervention helpful?"* Many of the participants found it helpful, except one participant. The participant felt she knew enough about stroke before completing the intervention and was not willing to change lifestyle modifications, despite an elevated ASCVD risk score. Another question asked, *"Will you change how you manage your stroke risk factors?"* The most common answer included they would monitor blood pressure at home routinely, implement lifestyle changes, increase physical activity, and address smoking cessation.

Discussion

Success

The project was successful in producing the intended outcome of increasing stroke knowledge, as evident from improvement in the post SKT scores. Many of the participants stated they found the intervention beneficial. The intervention was less than ten minutes, which means the information given to patients in a short amount of time increased their stroke awareness. The handouts also reinforced the teachings. The brief time frame increases the sustainability of the project for clinics with short appointment times. The education was directed towards the patient's risk factors and an overview of stroke symptoms. The intervention would be beneficial for patients when included in their regularly scheduled visits, especially patients who are at high-risk for a cardiovascular or stroke event.

Study Strengths

The study was conducted in a small Midwest community of fewer than 6,000 people and with only two-family medical offices in town. According to the CDC (n.d.), much of the population in the county has a sedentary lifestyle, which can lead to chronic health conditions. The clinic was ideal for a stroke education program with 80% of the population unable to identify stroke symptoms (Missouri Department of Health and Senior Services, n.d.). The family clinic staff was supportive and flexible during the educational intervention. The nurses and providers identified eligible participants and gave support seamlessly throughout the project. The intervention was deemed successful by the healthcare team at the clinic.

Results Compared to the Evidence

The synthesis of evidence revealed many educational interventions with varying degrees of success with some results aligning with the current project results. In the study by Sullivan and Katajamaki (2009), their results showed an increase in stroke education among individuals in the high and low-risk groups. Brochures, fact sheets, and 30-minutes of discussion were used

during the education intervention. The low-risk participants' average score increased by five points when comparing the pre and posttest, while the high-risk participants' average score increased by three points. Both groups retained scores on the one-week retention test (Sullivan & Katajamaki, 2009).

The study by Gutiérrez-Jiménez et al. (2011) developed a three-phase intervention consisting of a pre-survey, lectures with handouts, brochures, posters, and a post-survey. Fourth-year medical students gave the intervention lectures. Individuals recognized at least one stroke risk factor increased from 57.1% to 65.9% (Gutiérrez-Jiménez et al., 2011). Statistical significance found with having a better understanding of stroke risk factors included educational level, family history of stroke, employment, and obesity. No statistical significance was found between high and low-risk groups (Gutiérrez-Jiménez et al., 2011).

In the study by Holzemer et al. (2011), the participants had suffered a stroke and were getting secondary stroke prevention. The intervention was focused on increasing the participants' skills in the management of stroke risk factors. The control group received standard education given by nurses using written and verbal materials at patient discharge. At the time of discharge, the patient would receive education by a member of the stroke team. A telephone call was made to the participant by week three after discharge to follow up on medications, side effects, and to answer any questions. The results of the study showed the education intervention was successful at risk reduction measures, including blood pressure, total cholesterol, low-density lipoprotein, and high-density lipoprotein (Holzemer et al., 2011).

Limitations

Internal Validity Effects

SKT scores could have been higher on the posttest due to repeat of the test in a short time frame, instead of increased knowledge. Learning effects are variable (Sullivan & Katajamaki, 2009), as verbal communication is not the preferred method of learning for all participants. Questions were missed on the posttest showing the need for further education during the intervention. Sullivan and Katajamaki (2009) had a retention test at one week showing the education was retained. In the future, it would be reasonable to evaluate the retention of stroke knowledge and effects on the individual's lifestyle modifications over time.

The student investigator led the educational intervention with each participant and information could have been omitted or changed minimally from person to person. If patients were diagnosed with a stroke risk factor before the intervention, the risk factor was discussed in more detail to individualize the intervention content for the participant. Also, six participants did not have the ASCVD risk score calculated due to no lipid panel results in the health record. Not having the ASCVD risk score, the educational intervention became a basic overview of the information.

Older adult participants did not have the necessary computer skills or were not willing to take the pre and posttest on the computer. The student investigator read the questions and answer choices out loud for the participants, which could have affected scores.

External Validity Effects

The project sample was predominately Caucasian, and the highest level of school completed was high school, limiting the generalizability of the results. Generalizability could have also been affected by the small sample size. In the future, data needs to be collected by the providers and nurses, instead of relying on one person. The evidence-based intervention is

transferable to other clinics to use in addressing cardiovascular and stroke risk incorporated into patient education.

Sustainability of Effects

The providers will incorporate the ASCVD risk score and use the *Act FAST* campaign into their daily practice to continue to educate patients on their cardiovascular risk factors and improve their ability to recognize stroke symptoms. The nurses of the clinic can calculate the ASCVD risk score as a time saving component in short visits with the provider. If the nurse were not able to calculate the patient's ASCVD risk score due to missing data, it would prompt the provider to review the patient's medical records and bring their screening information up to date. The document "Know the Facts about Stroke" will also be posted in the waiting room and exam rooms, pending the providers' approval (CDC, 2019).

Interpretation

Expected and Actual Outcomes

The expected results for the quality improvement program were to increase stroke knowledge and awareness. When comparing the pre and post SKT, the outcome showed an increase in stroke knowledge. The demographics were unexpected, with the majority of the population as Caucasian and high school as the highest level of school completed. Issues the project had to overcome were having the providers relay if the patient was an eligible candidate during busy times at the clinic. Eligible patients were missed due to limited communication and time constraints.

Intervention Effectiveness (Inferences)

The intervention was successful at increasing stroke knowledge per the post SKT scores. “Know the Facts About Strokes” educational material was successful at reviewing basic stroke knowledge, risk factors, symptoms, and lifestyle modifications (CDC, 2019). The ASCVD risk calculator was used to calculate ten-year cardiovascular and stroke risk. The outcome measurements could be adjusted to show how affective lifestyle modifications are in preventing cardiovascular events. The setting for the intervention was in a private exam room, making it an ideal setting for test-taking. The environment was calm, quiet, and welcoming to support learning. The quality improvement project could be implemented in any family practice setting to promote prevention strategies and reduce stroke risk.

Intervention Revision

A recommended revision of the quality improvement project is to have the providers or nurses provide the education and utilize the ASCVD risk calculator. If the nurse is unable to calculate due to lack of a patient lipid panel on profile, they would relay the information to the provider. The provider could then order the lipid panel, and the nurse could complete the stroke education with the patient during their appointment, especially if they have stroke risk factors. Brochures or after visit summaries could be utilized as handouts for the patients to reference at home. The patients may need more follow up visits to assess their lifestyle modifications and further education.

Expected and Actual Impact to Health System, Costs, and Policy

The intended outcome of the quality improvement project was to increase stroke awareness, foster importance of managing stroke risk factors, and enhance identification of stroke symptoms. The results showed an increase in stroke knowledge. The healthcare impact is

to increase awareness of stroke and increase primary prevention strategies in a family practice setting. The estimated cost for the project was low. The only cost for the office was the established daily overhead cost. The project is free to implement into any family practice and beneficial for patients. The printing of the educational material is the only anticipated cost for the office. The providers would also have to be willing to implement the ASCVD review of results into their daily practice. Financially the project is sustainable.

Conclusions

Practical Usefulness of Intervention

The intended outcome for the project was to increase stroke knowledge leading to a decrease in the healthcare cost burden by stroke risk management, stroke education, and increasing stroke knowledge. The long-term intended effect is to have a reduction in the incidence and disability from stroke. The project identified those at risk for stroke and showed improvement in stroke knowledge. Participants were encouraged to recognize their stroke risk factors and establish lifestyle modifications to decrease their risk of stroke. Participants understood the significance of managing stroke risk factors to prevent cardiovascular and stroke events and when to activate the emergency medical system at the completion of the intervention (Marvanova & Henkel, 2019).

Further Study Intervention

In the future, it would be beneficial to widen the educational intervention to include family members due to the genetic component of stroke and the possibility of witnessing a stroke (Amano et al., 2014; Sullivan & Katajamaki, 2009). Although primary care providers are the leading educators for patients with stroke risk factors, the ASCVD risk calculator could be used by other medical specialties, such as neurology and cardiology, providing reinforcement

teachings. It would be interesting to determine if the intervention motivated individuals to change their lifestyle habits and decrease their ASCVD risk score. The intervention could be conducted across multiple sessions and include a nutritionist or dietitian for support with lifestyle modifications.

Dissemination

Poster presentations disseminated the project information. The project proposal poster was presented at the Advanced Practice Nurses of the Ozarks (APNO) in Branson, Missouri, in November 2019. The project was accepted to the poster presentation at the American Association of Neuroscience Nurses (AANN) in Orlando, Florida. However, the conference was canceled due to travel restrictions. The Sigma Theta Tau-Lambda Phi Chapter Scholarship was also awarded to cover conference costs for the AANN conference, initially. However, due to the cancelation of the conference, the scholarship was awarded to cover the cost of the APNO conference (See Appendix A, Cost Table). A manuscript will also be submitted to a journal for the dissemination of information. Providers will be encouraged to utilize the tools available to them, like the ASCVD risk calculator, to assist in preventing cardiovascular events for patients. Patients are encouraged to take control of their health status and discuss possible treatment plans that optimize a personal approach in addressing a decrease in stroke risk.

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Appendix A

Project Cost Table

Item	**Item Description**	**Quantity**	**Unit Cost**	**Anticipated Cost**
Direct Cost:				
Print materials	Paper, pens, printer ink	x100 copies	Paper $8.29 per ream (500 sheets) Printer Ink: $63.89 (price may vary depending on brand of printer) Pens: $6.99 (Officedepot.com)	
Equipment	Computer			
Miscellaneous				
Student Time		45 minutes max per participant	$0	$0
Indirect Costs:				
Office overhead	Lights, office space, staff's time		Approximately $83 per day for lights/energy. ($1660) (sustaindane.org)	
Total			$1739.17	

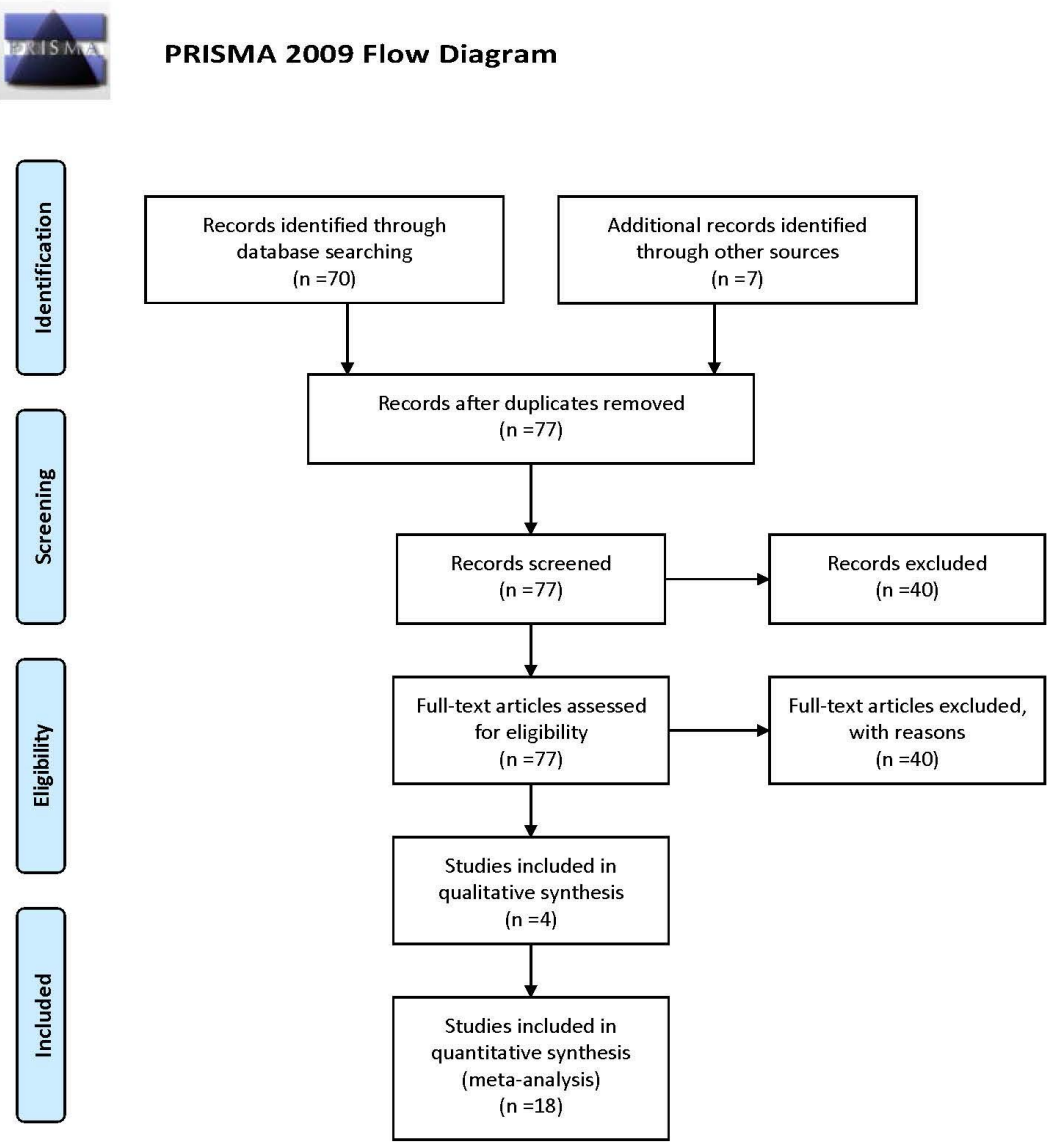
Budget for Sigma Theta Tau Scholarship

Student Name:

Attendance of the APNO Conference:		$150
Hotel: (3 nights, 4 days)		$326.96
Poster Printing:		$156.95
Travel:		$60.00
	Total:	**$693.91**

*Requesting total funds of $693.91. Poster presentation took place during the conference.

Appendix B PRISMA Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix C: Evidence Table

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
STROKE EDUCATION						
Sullivan (2009) Stroke education: Retention effects in those at low- and high-risk of stroke. Patient Education and Counseling	Retention of a stroke education class with patient who are high-risk and low-risk of having a stroke. **Stroke Education**	Quantitative, Quasi-experimental, mixed repeated measures design; Level 6; Stroke Knowledge Test (SKT), baseline, post, and retention test, measurement of stroke knowledge evaluating the educational intervention.	29 participants under the age of 50 and 44 participants over the age of 50; convenience sample	Stroke Knowledge Test, Baseline, Post, and retention test. Education was given to participants after the baseline test.	Baseline and retention test showed Significant differences. Not between post-education and retention, Analysis of Covariance (ANCOVA)	Convenience sample used, not generalizable, short retention interval of 1-week, Other variables affecting the association between knowledge and prevention
Amano, Yokota, Sakamoto, Shigehatake, Inoue, Ishigami, Hagihara, Tomii, Miyashita, Toyoda, Minematsu (2014). Stroke Education Program of Act FAST for Junior High School Students and Their Parents. Journal of Stroke and Cerebrovascular Diseases.	Stroke education intervention using the Act FAST campaign for middle school students and their parents. **Stroke Education**	Quantitative, Quasi-experimental, Level 3. Education on stroke symptoms for effectiveness of the program; junior high students and partents	190 students aged 12-13 years old, Convenience sampling	Students and parents were given a prequestionnaire on stroke knowledge and a posttest at 3 months.	Statistical analysis was performed using JMP7.0. Data was compared using the Fisher exact test. Students showed an improvement of identifying stroke symptoms and to call EMS.	Convenience sampling, small sample size, intervention at private schools, assessments were multiple-choice and closed-ended questions, Education is

						given by physicians
Thrift, Srikanth, Nelson, Kim, Fitzgerald, Gerraty, Bladin,Phan, Cadil hac, (2012). Risk Factor Management in survivors of stroke: a double-blind, cluster-randomized, controlled trial. International Journal of Stroke	An individualized education program for patient's after having a stroke to manage stroke risk factors. **Stroke Education**	Quantitative, experimental, randomized control trial, Level 2, assess the individualized management program (IMP) post stroke for risk reduction control and cost management compared to normal care.	285 per group, total 570, from 4 participating hospitals. consecutive sampling	Standard management post stroke compared to IMP post stroke. Framingham risk score	Binary logistic regression analysis, improved control of risk factors	limitations not addressed
Holzemer. (2011). Modifying Risk Factors After TIA and Stroke: The Impact of Intensive Education. American College of Nurse Practitioners.	An educational intervention to evaluate patient's ability to manage stroke risk factors. **Stroke Education**	randomized controlled design, Level 2, Preventing Recurrence of Thromboembolic Events through Coordinated Treatment (PROTECT) Program, The intervention group had additional, education before discharge delivered by a member of the stroke team and followed up with a telephone call by week 3 after discharge	52 patients were enrolled, 15 control and 12 treatment, 4 months of enrollment time, patients ages of 18-89 diagnosed with acute ischemic stroke or TIA were included, Randomizatio n	The score on the score card ranged from 0-26 and reflected stroke risk factors reported by the participant. Poor adherence rate was demonstrated by lower scores. Score card has not been validated.	The baseline scores were the same among the control and intervention group. At the 3-month check, the intervention group had higher scores on the report. A Mann-Whitney *U* test was calculated examining differences in report card scores and ANOVA analysis were used.	Control group was older than treatment group, sampling bias may have occurred, small sample size, Score card used has not been validated. The intervention group were larger compared to the control group.
An (2018) A Pilot Primary Stroke Prevention Program for Elderly Korean Americans. Journal of Neuroscience Nursing	Assess a primary stroke education intervention for	RCT. Level 2.	73 participants recruited from 2	Stroke prevention guidelines by the AHA/ASA	a 4-point Likert scale was used to measure satisfaction.	limitations: small sample size, short follow up

	Korean Americans. **Stroke Education**		centers for senior living. predominantly Korean Americans lived there. Participants were 65 years or older without a prior stroke.	were used to develop a 25-item stroke knowledge test. 3 experts in stroke assessed validity, X2 test and independent *t* test. The intervention group showed a better score on overall stroke knowledge scores and diet considerations compared to the control group.	Stroke knowledge improved in the intervention group.	period, limited generalizability, subject recall bias, attention bias due to the control groups not receiving as much attention.
Marvanova. (2019). A pharmacist-led stroke education and screening program for community-dwelling older adults. The Senior Care Pharmacist	an education intervention led by pharmacists for community residents, assess the effect of the intervention on stroke knowledge and risk-assessment questionnaire as a tool **Stroke Education**	quantitative, quasi-experimental, level 3, The stroke-knowledge and risk-assessment questionnaire	Independent adults age 18 years and older, four faith-based institutions in the Midwest. 97 enrolled into the study	Data from completed SKRAQs were imported to Stata 11.1 for descriptive statistics, paired t-test, and chi-square analyses. 100% Caucasians with an average age of 75 years old.	75% were able to name > or = 2 SRF correctly, 56.7% were able to list > or = 2 SWSs before the intervention. Post-intervention 91.8% were able to name 2 or more SRF and 90% were able to name 2 or more SWS.	limitations: 100% Caucasian population, highly educated population, low number of participants, single geographical area and only a single BP measurement

						per participant. Smoking and alcohol use may have been under reported.
Alberts (2012). Improving public education about stroke. ANNALS of the New York academy of sciences.	Public education on strokes. **Stroke Education**	Non-experimental. Level 7. Article reviews.	N/A	N/A	N/A	N/A
Turner (2016) Under-prescribing of prevention drugs and primary prevention of stroke and transient ischemic attack in the UK general practice: a retrospective analysis. Plos Med.	Analyzed electronic health records in primary care of patients that recently had a stroke to assess if their stroke risk factors had been treated prior to the stroke. **Stroke Education**	Quasi-experimental, cross-sectional study. Level 4.	29,043 people met the inclusion criteria. Median age was 74 years old.	data was collected from primary care database. Stroke/TIA clinical codes were used to recognize participants. Patients with a previous stroke were excluded.	STATA version 12 analysis; group differences tested using Pearson's chi-squared test; 6 out of 10 patients were eligible for prevention drugs; more than half of the patients had not been prescribed prevention medication.	Limitations: Under-prescribing medications was not defined and did not address medication adherence.
STROKE RISK FACTORS						
Stroebele, Muller-Riemenschneider, Nolte, Muller-Nordhorn, Bockelbrink, Willich. 2011. Knowledge of risk factors, and warning signs of stroke: a systematic review from a gender perspective. International Journal of Stroke.	A review of literature to assess knowledge of stroke warning signs and risk factors.	Systematic Review, Level 3, Purpose to identify differences in stroke knowledge between men and women	Exclusion criteria: secondary prevention of stroke, studies not addressing information on gender,	22 studies were selected for review.	Majority of participants were able to name at least one stroke risk factor and one symptom of stroke. Majority showed women	English and German studies only, publication bias can't be excluded, participants' age varied

	Stroke Risk Factors		case studies, editorials, abstracts. Two independent investigators		had a better knowledge of stroke compared to men	widely among studies.
Guiterrex-Jimenez, Gongora-Rivera, Martinez, Escamilla-Garza, Villarreal, 2011. Knowledge of Ischemic stroke risk factors and warning signs after a health education program by medical students. Stroke.	Medical students completed an educational intervention to address stroke knowledge. **Stroke Risk Factors, Stroke Knowledge**	Quantitative, RCT, Level 2, three stages to the study: first, surveys to understand the participants' baseline knowledge of risk factors and warning signs of stroke; second, 6 months of educational programs with lectures and handouts; third, survey and questionnaire to evaluate post-intervention knowledge. Education included, basic information on stroke risk factors, symptoms, and prevention of ischemic stroke	329 subjects were surveyed in the first stage, 355 questionnaires in the third stage; one-third were randomly selected from apartments of multifamily housing units	Surveys and questionnaire were given to participants to understand their pre and post intervention knowledge of stroke risk factors and symptoms and evaluate the educational program with lectures and handouts.	Survey prior to the educational program 57.1% mentioned at least one risk factor and 31.1% mentioned two or more. 37.6% could identify at least one warning sign, 11.5% identified 2 or more. After the educational program, 65.9% could identify one risk factor, 43.9% could identify 2 or more. 48.1% could identify one or more warning signs and 18.9% identified 2 or more. To assess the pre and post-intervention, a X^2 test and Mann-Whitney U test were used. A X^2 test was	Not generalizable due to many families living in a multi-family home. surveys were completed at different times with double randomizatio n without personal follow-up

					performed to determine differences between high- and low-risk populations and stroke knowledge.	
National Guideline Clearinghouse (2014) Guidelines for the prevention of stroke in women: a statement for healthcare professionals from the American Heart Association/American Stroke Association	To provide evidence-base practice recommendations for patients at risk for a stroke. **Stroke Risk Factors**	EBPG: Systematic review level 4 Guideline provided data on stroke risk factors for women, to provide a new guideline for stroke prevention specific to women, Recommendations: tables to define recommendation and level of evidence.	Electronic databases were searched: ovid medline, pubmed, cardio-source clinical trials database, Cochrane library, embase, and google scholar. Number of articles not listed	N/A	Review of published meta-analyses, expert consensus was used to formulate the recommendations	Limited populations evaluated (evidence levels B and C)
Meschia, J. F., Bushnell, C., Boden-Albala, B., Braun, L. T., Bravata, D. M., Chaturvedi, S., … Wilson, J. A. (2014). Guidelines for the Primary Prevention of Stroke. Stroke.	comprehensive and evidence-base practice recommendation on prevention for individuals at risk for stroke. **Stroke Risk Factors**	EBPG, Systematic review level 1, summarizes the evidence on stroke risk factors and an update from the American Heart Association.	Articles from multiple databases like Pubmed and Ovid, including: SR; RCT, meta-analyses; and cohort studies.	N/A	Table 5 shows updated recommendations. A new recommendation is for atrial fibrillation, use anticoagulant if there is a low risk for hemorrhage. There are many recommendation	There isn't a validated research tool to assess stroke risk factors, diet and exercise are challenging to study

					s for each risk factor listed.	
Bushnell (2014) A new model for secondary prevention of stroke: Transition coaching for stroke. Frontiers in Neurology	New model for discharge post stroke prevention care measuring and addressing the importance of medication-adherence. **Stroke Risk Factors**	Quantitative, quasi-experimental; Level 4 cohort study; patients that had a stroke/TIA monitored via follow up on medication adherence	171 patients enrolled, 15 went to a skilled nursing facility, 14 lost to follow up, 142 included in the analysis. Consecutive sample	Transitional coaching for stroke (TRACS) program	medication persistence was 80.3%, first time strokes were at 78.9% vs 60.7% for a recurring stroke, p=0.045	Limitations not addressed
Gorelick (2015). Population-based approaches for reducing stroke risk. Expert Review of Cardiovascular Therapy	Discuss stroke burden, stroke risk factors, prevention **Stroke Risk factors**	Non-experimental, level 7, stroke risk factors and prevention	N/A	N/A	N/A	N/A
Boehme (2017). Stroke Risk Factors, Genetics, and Prevention. Circulation Research.	Identify Stroke risk factors, genetics, and prevention. **Stroke risk factors**	Non-experimental, level 7, stroke risk factors and prevention.	N/A	N/A	N/A	N/A
Ovbiagele. (2011). Stroke Epidemiology: Advancing our understanding of disease mechanism and therapy. Neurotherapeutics	Identify groups at risk for stroke **Stroke risk factors**	Non-experimental, level 7, identify groups at risk for stroke and stroke risk factors	N/A	N/A	N/A	N/A
STROKE KNOWLEDGE						
Dombrowski, S. U., Mackintosh, J. E., Sniehotta, F. F., Araujo-Soares, V., Rodgers, H., Thomson, R. G., … White, M. (2013). The impact of the UK "Act	Effects of mass media stroke campaigns on the intent to	Qualitative, semi-structured interviews. Level 6. Interviews were conducted to	Stroke patients, stroke witness, and	Interviews were conducted and analyzed.	Many participants knew of the campaign, some	All data is based on reflection of the situation,

FAST" stroke awareness campaign: content analysis of patients, witness and primary care clinicians' perceptions. BMC Public Health	activate the emergency medical system when stroke symptoms are present. **Stroke Knowledge**	assess individual's opinion on the 'Act FAST' campaign.	primary care clinicians. Purposive sampling	Coding was completed by NVivo9 using a 3-step process. Interviews were conducted to understand an individual's knowledge on stroke symptoms due to the 'Act FAST' campaign.	thought the campaign made an impact on recognizing stroke symptoms quicker, however most participants thought it made no impact, some thought the 'Act FAST' campaign was confusing. 19 patients, 26 witnesses, 30 primary care clinicians	prone to biases, no prompts were included during the interviews, purposively selected samples from key groups, interviews were complete after the second phase of the 'Act FAST' and views may have changed.
Nishikawa, Okamura, Hakayama, Miyamatsu, Morimoto, Toyoda, Suzuki, Toyota, Hata, Yamguchi (2016) Effects of a Public Education Campaign on the Association Between Knowledge of Early Stroke Symptoms and Intention to Call an Ambulance at Stroke Onset: The Acquisition of Stroke Knowledge (ASK) Study. Journal of Epidemiology.	The effects of an educational campaign (2 years) to improve stroke knowledge and the intent to call an ambulance. **Stroke Knowledge**	Quantitative, Quasi-experimental, Level 3. Non-randomized community intervention to assess the knowledge of stroke in the general population. There was a pre-survey mailed to participants, followed by a community intervention, and a post-intervention survey.	3 communities participated in the study. Community residents were aged 40-74; randomly selected, 71.3% was the overall response rate.	Pre and Post intervention Self-administered surveys were mailed to participants. During the intervention leaflets, booklets, and lectures were given to participants. Booklets were disseminated to homes in the areas identified	Differences in stroke knowledge and demographic characteristics were analyzed by Pearson's chi-square test and Fisher's exact test. Effects of the stroke education was analyzed by McNemar's test, $p < 0.05$ was significant. In the moderate and intensive areas,	In the intervention area, 4 of the 5 correct stroke symptoms were selected on the pre-intervention survey. The control group also showed changes between stroke symptoms and the intent

				as high-risk. The intensive area, booklets were distributed twice, leaflets were 12 times, and lectures 13 times.	Stroke symptoms improved significantly; not in the control. In the preintervention survey, the intent to call an ambulance was 81.7% and in post-intervention was 80.1% overall.	to active emergency services.
Sloma. (2010). Knowledge of stroke risk factors among primary care patients with previous stroke or TIA: a questionnaire study. BMC Family Practice	Assess the patients understanding their risk for having a second stroke in primary care and Patients' understanding of personal risk factors and how to prevent cardiovascular events **Stroke Knowledge**	Quantitative, cross-sectional. Level 4. Postal questionnaire study to assess knowledge about diseases and conditions that have been identified as risk factors for stroke.	240 patients, Patient population found by medical records and stroke register.	A literature review was completed to develop the questionnaire. It contained open and closed ended questions.	Only 62% of the patients knew having a previous stroke put them at a higher risk for another one. Continuous variables= t test; categorical variables= chi-square test	Questionnaire was designed for the study. Small number of participants in some of the sub-groups.
Sundseth. (2014). Factors Related to Knowledge of Stroke Symptoms and Risk Factors in a Norwegian Stroke Population. Journal of Stroke and Cardiovascular Diseases.	Using open-ended questions to identify familiarity of stroke risk factors and	Qualitative, Level 6, Structured Interviews were completed by two individuals within 72 hours of the patient	287 patients. Patients with suspected stroke, 18-years or	Structured interviews. Knowledge of stroke risk factors and symptoms	43.2% were able to name 1 risk factor of stroke. 13.9%	Poor knowledge could have been related to recently having a

	symptoms in those who have suffered from a stroke. **Stroke Knowledge**	being hospitalized for a stroke.	older were included.	were found by asking open-ended questions. Reliability not reported.	were able to identify 2 of the 3 risk factors, 1.7% knew all 3. The statistical analysis was completed using SPSS. C2 statistics or fisher exact test were used for categorical variables.	stroke and having cognitive deficits.
Miscellaneous						
Souter, Kinnear, Kinnear, Mead (2014). Optimization of secondary prevention of stroke: A qualitative study of stroke patients' beliefs, concerns and difficulties with their medicines. The International journal of pharmacy	Identify barriers contributing to medication adherence in secondary stroke prevention.	Qualitative. Level 6. Study looks to explore stroke patients' and their care givers' beliefs and concerns about their medications, along with barriers to medication compliance for stroke prevention.	30 participants, women and male, patients with ischemic or hemorrhagic stroke discharged over a 12-month period, purposive sampling	Participants were interviewed, digitally recorded by one pharmacist, data was analyzed by the researcher using a framework approach, different themes were seen and validated by another research team member	Main themes noted: beliefs and concerns about medications, barriers related to medicine use, level of understanding, and delivery of healthcare. Forgetfulness was the number one reason for medication noncompliance. A qualitative software package NVivo2.0, along with a single researcher to interview and analyze data.	Interviews took place in one setting instead of a longitudinal study, analysis and interviews were performed by one researcher limiting how many transcripts could be validated.

Weerd, Groenhof, Kollen, Vander Meer (2013). Survival of Stroke Patients after introduction of the 'DutchTransmural Protocol TIA/CVA'. BMC Family Practice	New protocol to improve secondary stroke prevention strategies.	Quantitative, non-experimental study, Level 4 cohort, cohorts survival rates were compared after the DutchTransmural Protocol TIA/CVA was implemented	2 cohorts= 263 patients total Quota sample	year one follow-up (p=0.511), year two follow up (p=0.188), no significant difference	not a significant difference between cohorts 1 and 2	No major differences in the cohorts to begin with, population selected from general practices

Appendix D

Definition of Terms

Hemorrhagic stroke: Bleeding on the brain due to a weakened vessel wall/aneurysm, when the blood enters the brain tissue it causes increase pressure of those brain cells and can cause damage or cell death (Saint Luke's Hospital, n.d.).

Atrial fibrillation: Dysrhythmia of the heart, increasing the risk of stroke (Meschia et al., 2014).

Hypertension: Increased blood pressure

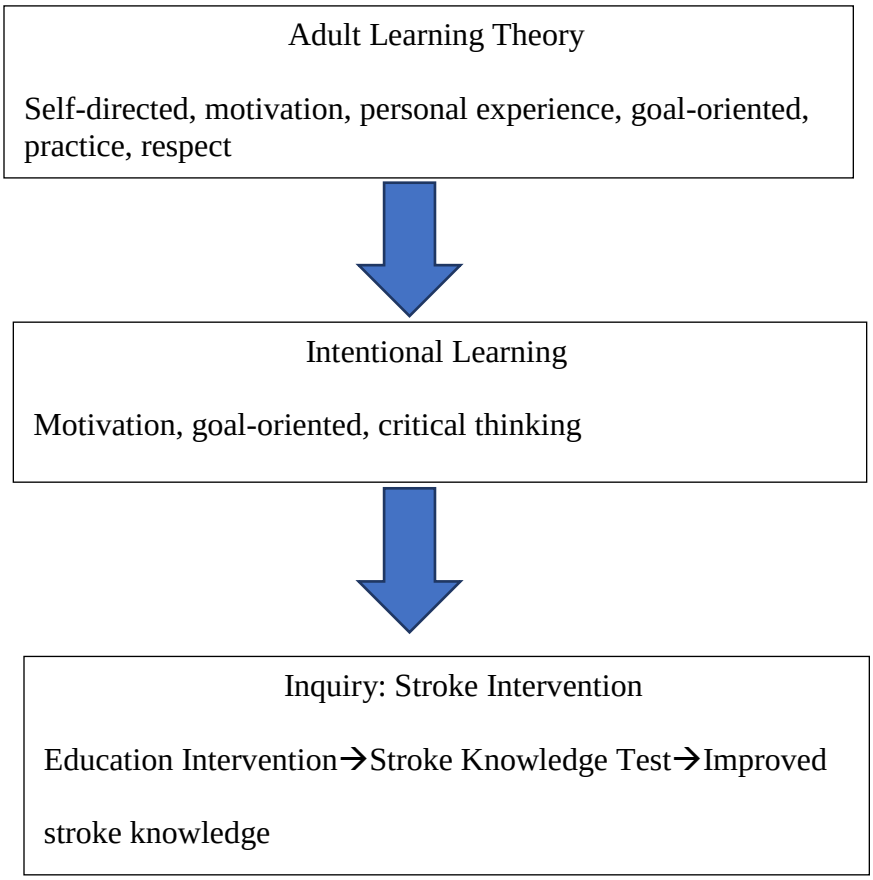
Cholesterol: part of lipids in the body, if they are elevated, increased risk for cardiovascular disease (Meschia et al., 2014).

Alteplase: Medication is given intravenously to patients suffering from a stroke; it is a “clot-busting” medication (Saint Luke's Hospital, 2017).

Interventional radiology (Endovascular): An emergent procedure in the hospital for patients suffering from a large vessel stroke (Saint Luke's Hospital, 2017).

Appendix E

Theory to Application Diagram



Appendix F

IRB Approval

Institutional Review Board
University of Missouri-Kansas City
5319 Rockhill Road Kansas City, MO 64110
816-235-5927
umkcirb@umkc.edu

Dear Samantha L. Nolker (UMKC-Student),

A member of the UMKC Research Compliance Office screened your QI Questionnaire to project #2015994-QI entitled "Primary Stroke Education Using the ASCVD Risk Calculator and the Stroke Knowledge Test in Primary Care" and made the following determination:

QI Determination: The project has been determined to be a quality improvement activity not requiring IRB review.

If you have any questions regarding this determination, please feel free to contact our office at 816-235-5927, umkcirb@umkc.edu, or by replying to this notification.

Note Regarding Publications: It is appropriate to disseminate and replicate QI/program evaluation successes, including sharing the information external to an organization. This may include presentations and publications. The mere intent to publish the findings does not require IRB review as long as the publication does not refer to the activity as research.

Thank you,
UMKC Institutional Review Board

Appendix G

Recruitment Materials

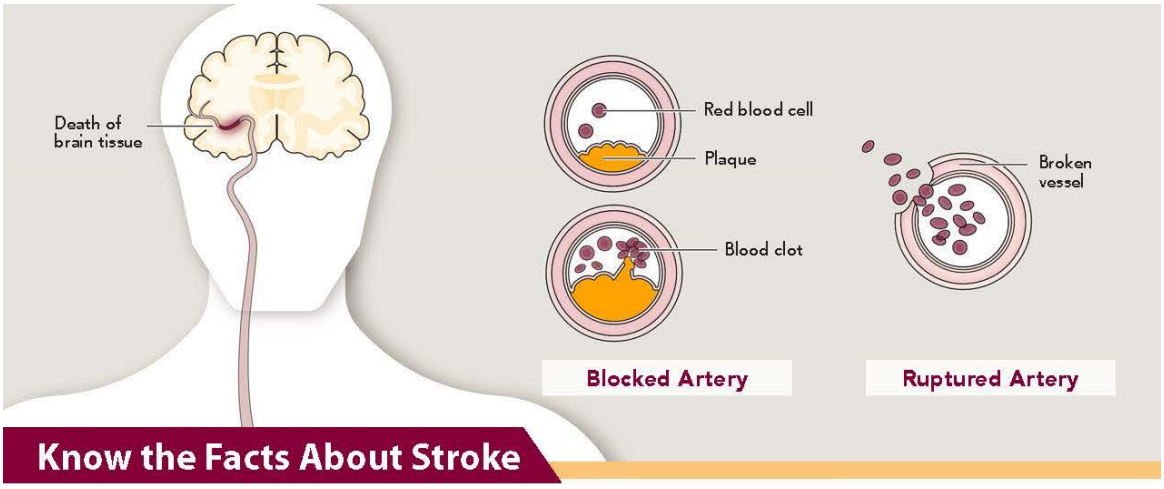
Script for Investigator Initiated In-person Contact

1. Introduction of the investigator:
    a. Good (morning or afternoon) sir/madam:
    b. Do you have a minute?
    c. Let me introduce myself:
        i. My name is _____, I am a student nurse practitioner at the_____ university, and I am working on a quality improvement project with the nurse practitioner at the clinic.
2. Immediate opportunity to opt-out
    a. I am here to see if you are interested in hearing more about our study. Is it ok for me to continue?
        i. If the answer is no: thank them for their time, do not continue.
        ii. If the answer is yes: Thank you, is this time ok to continue to talk?
3. Make a BRIEF statement about why he/she was selected
    a. I am approaching you to see if you would like to participate in the study. _____ (Provider's name) recognized you matched the inclusion criteria for the study of 30 years or older, with no prior history of a stroke. This study is separate from the care you receive at the clinic and whether you decide to hear more about the research will not affect your care.
4. Ask if he/she is interested in hearing more details.

a. Are you interested in hearing more about the study?
    i. If not interested, thank them for their time.
    ii. If interested, move to the consent form (Boston University Medical Campus, 2017).

Appendix H

Educational Material



Know the Facts About Stroke

What is stroke?

Stroke kills nearly 150,000 of the 860,000 Americans who die of cardiovascular disease each year—that's 1 in every 19 deaths from all causes.

A stroke, sometimes called a brain attack, happens in one of two ways:

- **Ischemic stroke**—when the blood supply to the brain is blocked
- **Hemorrhagic stroke**—when a blood vessel in the brain bursts

A stroke causes brain tissue to die, which can lead to brain damage, disability, and death. Stroke is the fifth leading cause of death in the United States and the leading cause of serious long-term disability. This is disturbing because about 80% of strokes are preventable. You can greatly reduce your risk for stroke by making lifestyle changes to help control your blood pressure and cholesterol levels and, in some cases, by taking medication.

Are you at risk?

Anyone, including children, can have a stroke at any time. Every year, about 800,000 people in the United States have a stroke—and about 1 out of 4 of those strokes are recurrent strokes. Having one stroke means you have a greater risk of having another (or recurrent) stroke.

Several factors that are beyond your control can increase your risk for stroke. These include your age, sex, and ethnicity. But there are many unhealthy habits, such as smoking, drinking too much alcohol, and not getting enough exercise, that you can change to lower your stroke risk. Using tobacco products and having high blood pressure, high cholesterol, diabetes, or obesity can also increase your risk for stroke. However, treating these conditions can reduce your risk. Ask your doctor about preventing or treating these medical conditions.

If Stroke Happens, Act F.A.S.T.

F—FACE DROOPING
Ask the person to smile. Does one side droop?

A—ARM WEAKNESS
Ask the person to raise both arms. Does one arm drift downward?

S—SPEECH DIFFICULTY
Ask the person to repeat a simple sentence. Are the words slurred?

T—TIME TO CALL 9-1-1
If the person shows any of these signs, call 9-1-1 immediately.

National Center for Chronic Disease Prevention and Health Promotion
Division for Heart Disease and Stroke Prevention

What are the signs and symptoms?

An easy way to remember the most common signs of stroke and how to respond is with the acronym **F.A.S.T.**:

F = Face drooping: Ask the person to smile. Does one side droop?

A = Arm weakness: Ask the person to raise both arms. Does one arm drift downward?

S = Speech difficulty: Ask the person to repeat a simple sentence. Are the words slurred?

T = Time to call 9-1-1: If the person shows any of these signs, call 9-1-1 immediately. Stroke treatment can begin in the ambulance.

Other common signs of stroke are

- Sudden dizziness, trouble walking, or loss of balance or coordination
- Sudden trouble seeing in one or both eyes
- Sudden severe headache with no known cause
- Sudden numbness of the face, arm, or leg
- Sudden confusion or trouble understanding others

If you think that you or someone you know is having a stroke, call 9-1-1 immediately. Stroke is a medical emergency, and stroke treatment and outcomes depend on how fast you get to the hospital and the type of stroke you had. When you are transported by ambulance, first responders may be able to start your treatment right away and can alert the hospital that a stroke patient is on the way. This notification gives the hospital's medical team time to prepare equipment and medicines you may need.

How is stroke diagnosed?

Your doctor can perform several tests to diagnose stroke, such as brain imaging, including a magnetic resonance imaging (MRI) or computed tomography (CT) scan, tests of the brain's electrical activity, and blood flow tests.

Can it be prevented?

High blood pressure is the single most important treatable risk factor for stroke. Preventing, diagnosing, and controlling it through lifestyle changes and medicine are critical to reducing stroke risks.

There are several steps you can take to reduce your risk for stroke:

- **Eat a healthy diet low in sodium with plenty of fruits and vegetables.** Tips on nutrition are available at CDC's Division of Nutrition, Physical Activity, and Obesity website.
- **Maintain a healthy weight.** CDC's Healthy Weight website includes information and tools to help you lose weight.
- **Be physically active.** Visit CDC's Physical Activity website for more information on being active.
- **Don't smoke, and avoid secondhand smoke.** CDC's Office on Smoking and Health website has information on quitting smoking.
- **Limit alcohol use.** See CDC's Alcohol and Public Health website for more information.
- **Prevent or manage your other health conditions,** especially high blood pressure, high cholesterol, diabetes, and obesity. Visit CDC's High Blood Pressure, Cholesterol, and Diabetes webpages on these conditions to learn more.

How is it treated?

If you have a stroke, you may receive emergency care, treatment to prevent another stroke, rehabilitation to help you relearn the skills you may have lost because of the stroke, or all three. In addition, lifestyle changes, such as the ones listed above, can help lower your risk for future strokes. Talk with your doctor about the best ways to reduce your stroke risk, and always take medicines as prescribed.

For More Information

Learn more about stroke at the following websites:

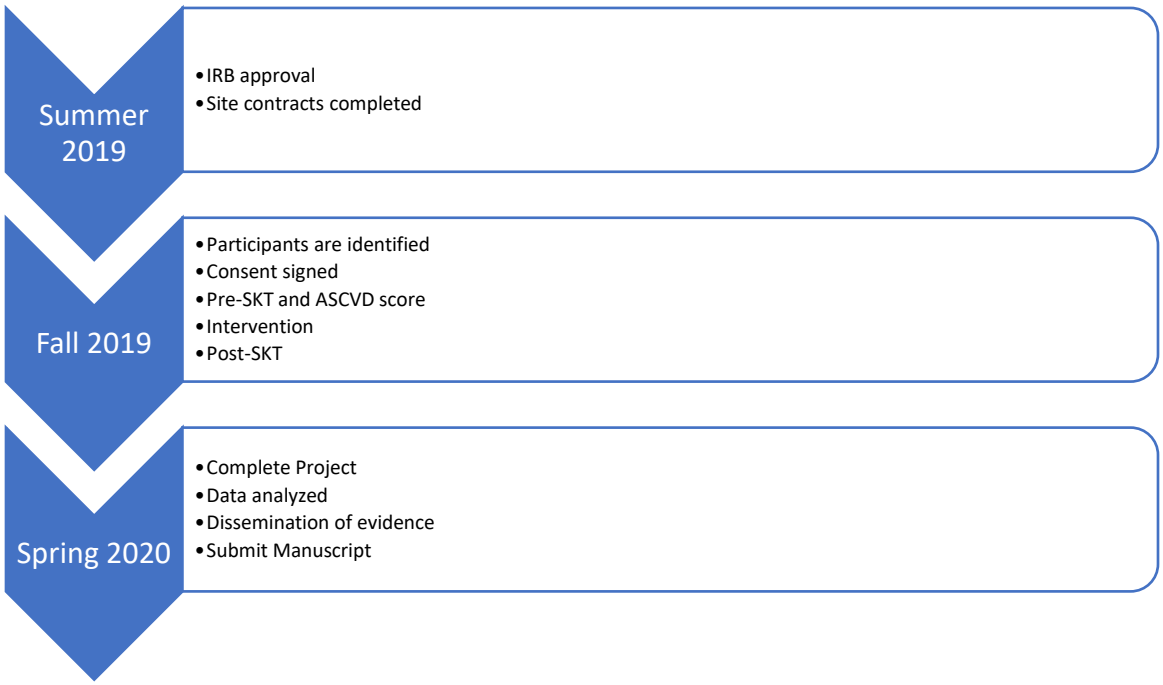
- CDC's Division for Heart Disease and Stroke Prevention
- Paul Coverdell National Acute Stroke Program
- Million Hearts®
- CDC *Vital Signs* report: Preventing Stroke Deaths
- American Stroke Association
- National Institute of Neurological Disorders and Stroke, Mind Your Risks® campaign

Learn more by visiting www.cdc.gov/dhdsp

May 2019

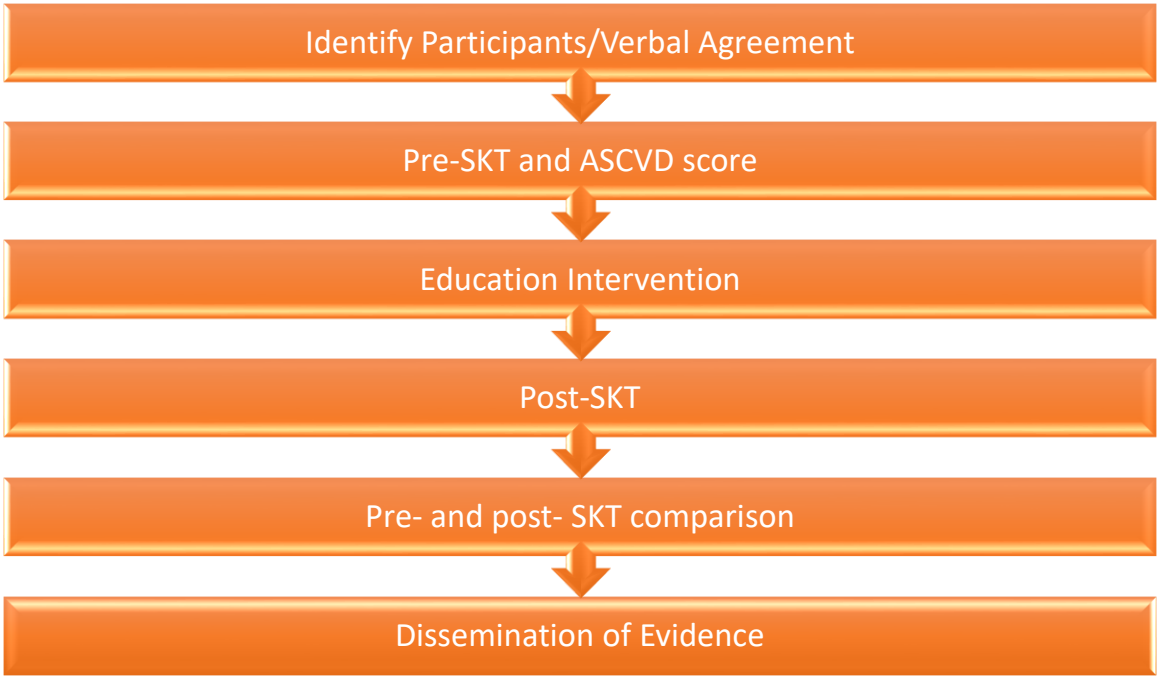
Appendix I

Project Timeline Flow



Appendix J

Intervention Flow Diagram



Appendix K

Logic Model

Rev. 7/09, 1/2015 http://www.uwex.edu/ces/lmcourse/interface/coop_M1_Overview.htm Logic-Model Worksheet content revisions by Lyla Lindholm for DNP Project. Not to be placed on web for public use. For UMKC DNP coursework only.

Logic Model for DNP Project					
Inquiry, PICOTS: In adult patients over the age of 30, does a stroke education program on lifestyle modifications and stroke risk utilizing the ASCVD Risk Estimator improve ASCVD risk factors and stroke knowledge over a six-month period at family clinic?					
Inputs	**Intervention(s)** *Activities*	**Outputs** *Participation*	**Outcomes -- Impact** *Short*	*Medium*	*Long*
Evidence, sub-topics 1. Stroke Risk Factor Management 2.Stroke Education 3.Stroke Knowledge **Major Facilitators or Contributors** 1. Family clinicsStaff 2. Preceptors 3. Mentor **Major Barriers or Challenges** 1. IRB Approval 2. Time constraints for the clinic providers and participants 3. Limited patient participation 4. Participant not having lipid profile screening completed prior to participation and not being able to calculate an ASCVD score	**EBP intervention which is supported by the evidence in the Input column (brief phrase)** A stroke education program utilizing the ASCVD risk estimator to improve stroke risk factors and stroke knowledge. **Major steps of the intervention (brief phrases)** 1. Identify candidates to participate 2. Patient consent 3. Patient takes the pre-intervention SKT 4. Calculate the ASCVD risk 5. Provide individualized education 6. Patient to take the post-intervention test 7. Compare pre- and post- test outcomes	**The participants (subjects)** Adult patients aged 30 years or older without a previous stroke **Site** Midwest family practice **Time Frame** Six months **Consent or assent Needed** Verbal **Other person(s) collecting data (yes, no)** No **Others directly involved in consent or data collection (yes/no)** No	**(Completed during DNP Project)** **Outcome(s) to be measured** **Primary:** Compare pre- and post-intervention scores of the SKT **Secondary**, if applies: **Measurement tool(s)** 1. Stroke Knowledge Test 2. Atherosclerotic Cardiovascular Disease (ASCVD) Risk Estimator **Statistical analysis to be used** **1.** Paired *t*-test **2.** McNemar Test **3.** Descriptive	**(after student DNP)** **Outcomes to be measured** Providers utilizing the ASCVD Risk Estimator for all patients over the age of 30 for educational purposes on stroke risk factors and stroke knowledge.	**(after student DNP)** **Outcomes that are potentials** Decrease the incident of stroke, disability from strokes, and healthcare cost

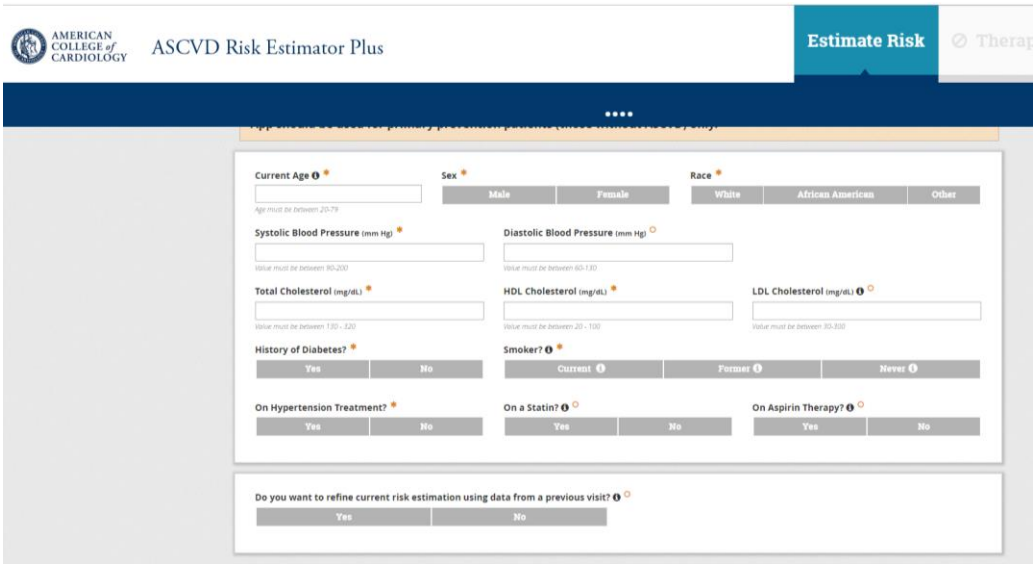
Appendix L

Measurement Tools

The Stroke Knowledge Test

"Permission obtained, but the tool is not to be placed into the public domain."

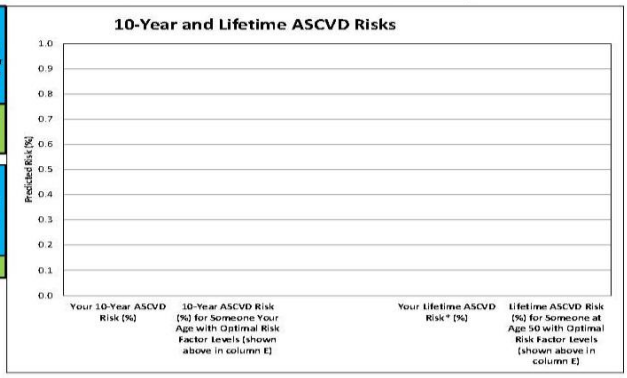
ASCVD Risk Calculator Online View



ASCVD Risk Calculator Paper View

		Enter patient values in this column		
Risk Factor	**Units**	**Value**	Acceptable range of values	Optimal values
Sex	M (for males) or F (for females)		M or F	
Age	years		20-79	
Race	AA (for African Americans) or WH (for whites or others)		AA or WH	
Total Cholesterol	mg/dL		130-320	170
HDL-Cholesterol	mg/dL		20-100	50
Systolic Blood Pressure	mm Hg		90-200	110
Treatment for High Blood Pressure	Y (for yes) or N (for no)		Y or N	N
Diabetes	Y (for yes) or N (for no)		Y or N	N
Smoker	Y (for yes) or N (for no)		Y or N	N

Your 10-Year ASCVD Risk (%)	**This calculator only provides 10-year risk estimates for individuals 40 to 79 years of age Enter M or F for Gender Enter WH or AA for race Enter 130-320 for TC value Enter 20-100 for HDL value Enter 90-200 for SBP value Enter Y or N for treatment for hypertension Enter Y or N for Diabetes Enter Y or N for Smoker**
10-Year ASCVD Risk (%) for Someone Your Age with Optimal Risk Factor Levels (shown above in column E)	**Enter M or F for Gender This calculator only provides 10-year risk estimates for individuals 40 to 79 years of age Enter WH or AA for race**
Your Lifetime ASCVD Risk* (%)	**This calculator only provides lifetime risk estimates for individuals 20 to 59 years of age Enter M or F for Gender Enter 130-320 for TC value Enter 90-200 for SBP value Enter Y or N for treatment for Hypertension Enter Y or N for Diabetes Enter Y or N for Smoker**
Lifetime ASCVD Risk (%) for Someone at Age 50 with Optimal Risk Factor Levels (shown above in column E)	**Enter M or F for gender**



***This is the lifetime ASCVD risk for an individual at age 50 years with your risk factor levels. In rare cases, 10-year risks may exceed lifetime risks given that the estimates come from different approaches. While 10-year risk estimates are derived from methods and data using continuous variables, the reported estimate of lifetime risk is based on assigning each person into one of 5 mutually exclusive sex-specific groups, as per Lloyd-Jones et al., Circulation 2006; 113(6):791-8. Within each of the 5 groups, each person receives the same lifetime risk estimate. In other words, using this approach, there are only 5 possible lifetime risk estimates reported for men and only 5 possible lifetime risk estimates reported for women. In some cases, the average risk for the group will underestimate the individual's true lifetime risk. This feature of lifetime risk estimation will result in the estimated lifetime risk being less than the estimated 10-year risk. In these cases, the 10-year risk should be the primary focus for the risk discussion and risk reduction efforts. As further data becomes available and incorporated and methods mature, lifetime risk estimates based on continuous variables will be possible.**

For patients and the public: "This is the lifetime risk of cardiovascular diseases, including stroke, for an individual at age 50 years with your risk factor levels. In rare cases, 10-year risks may exceed lifetime risks given that the estimates come from different mathematical approaches. If this is the case, the 10-year risk should be the primary focus for your risk discussion with your provider and for your efforts to reduce your risk.

Abbreviations: AA = African American; ASCVD = Atherosclerotic cardiovascular disease, defined as CHD death, nonfatal myocardial infarction, or fatal or nonfatal stroke; F = Female; M = Male; N = No; WH = White; Y = Yes.

Appendix M

Permission for Use of the Stroke Knowledge Test

Flag for follow up. Start by Monday, June 03, 2019. Due by Monday, June 03, 2019.

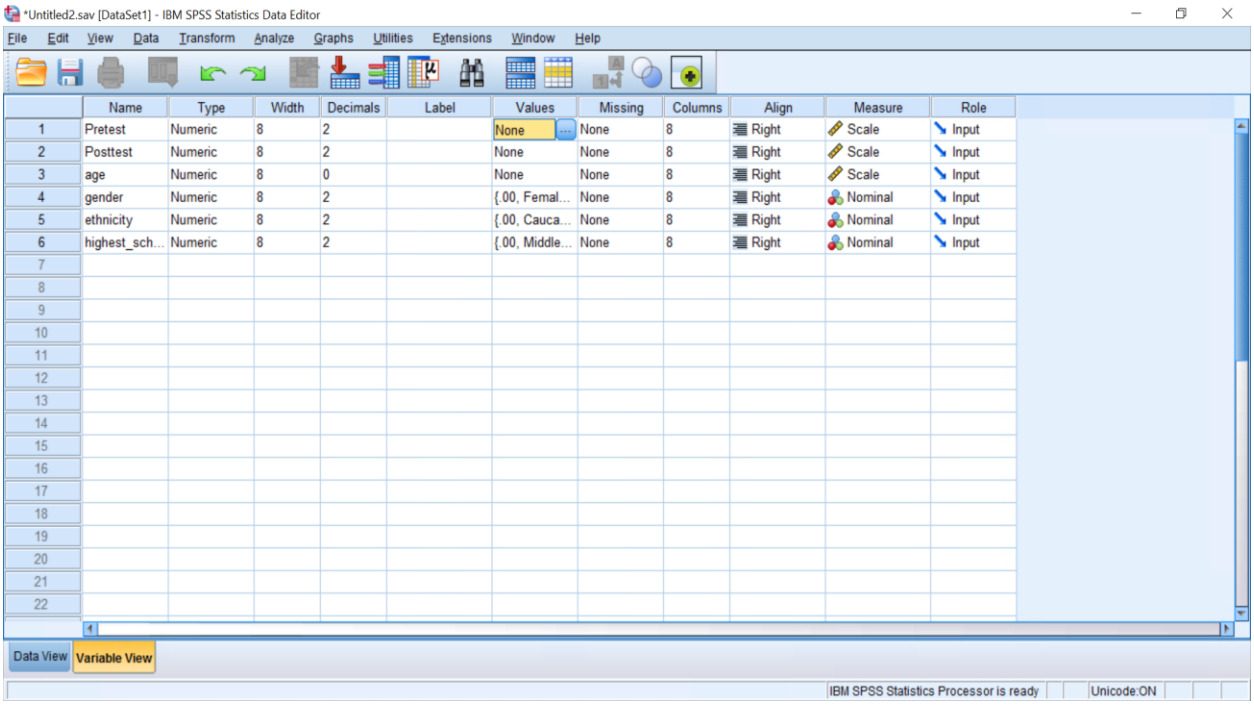
Dear Ms Nolker,

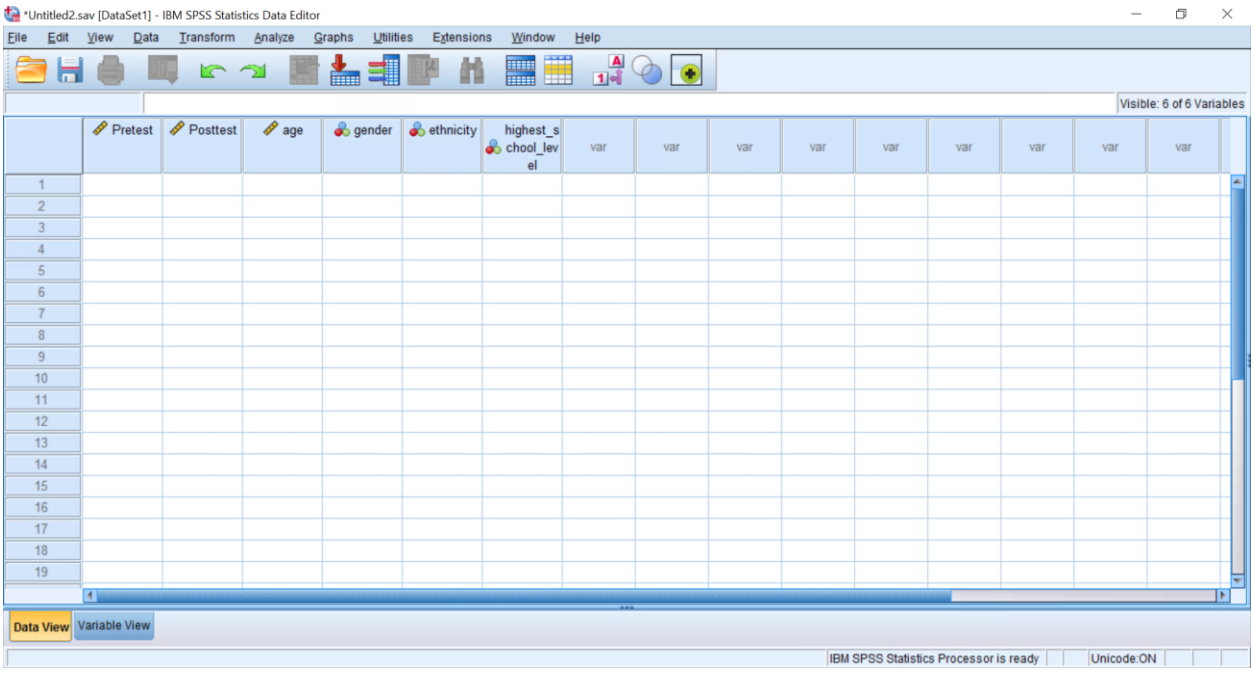
This sounds like a great project. I would be happy for you to use this test in the proposed project. Please let me know if you require any further information,

Kind regards
Karen Sullivan

Appendix N

Data Collection Template





Appendix O

Statistical Analysis Tables

Table 1. Paired *t*-test pre and post stroke knowledge test

	Mean	N	Std. Deviation	Std. Error Mean
pretesttotal	12.8800	25	2.61916	.52383
Posttest	18.4000	25	1.50000	.30000

Table 2. McNemar Test

Test Statis

	A1 & postA1	A2 & postA2	A3 & postA3	A4 & postA4	A5 & postA5	A6 & postA6	A7 & postA7	A8 & postA8	A9 & postA9	A10 & postA10
N	25	25	25	25	25	25	25	25	25	25
Exact Sig. (2-tailed)	.125[b]	.016[b]	.008[b]	.000[b]	.000[b]	1.000[b]	.500[b]	1.000[b]	1.000[b]	.004[b]

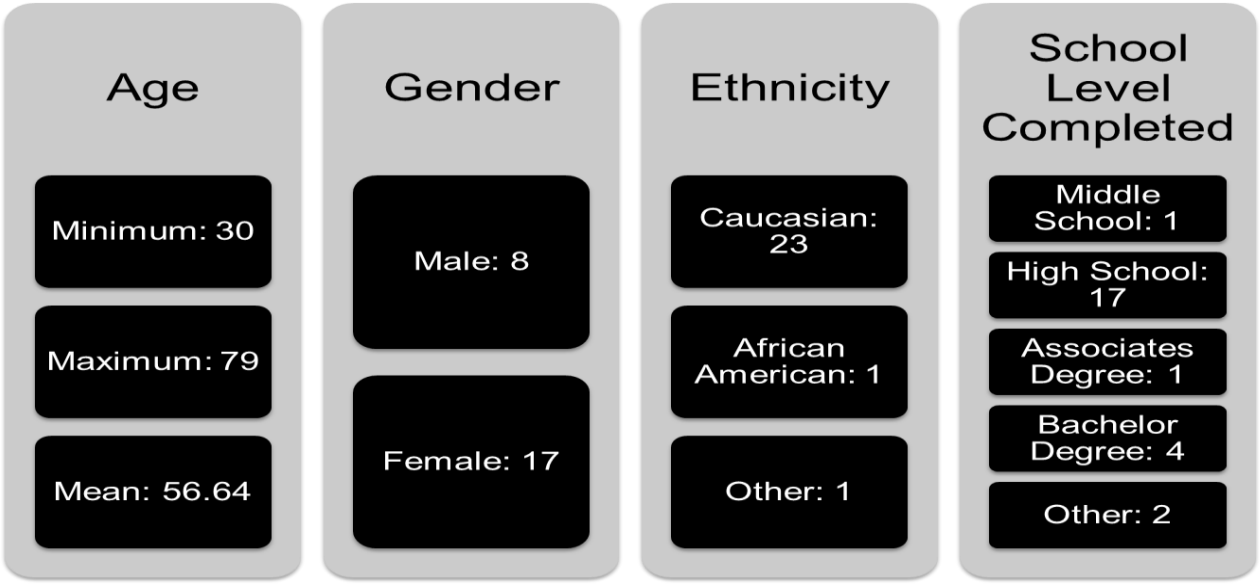
a. McNemar Test

b. Binomial distribution used.

stics[a]

A11 & postA11	A12 & postA12	A13 & postA13	A14 & postA14	A15 & postA15	A16 & postA16	A17 & postA17	A18 & postA18	A19 & postA19	A20 & postA20
25	25	25	25	25	25	25	25	25	25
.063[b]	.125[b]	1.000[b]	.000[b]	.109[b]	.000[b]	1.000[b]	.000[b]	1.000[b]	1.000[b]

Table 3. Descriptive Statistics



Faculty Approval Letter

July 17, 2019

DNP Project Proposal Approval

UMKC DNP Student

This letter serves to provide documentation regarding Samantha Nolker's Doctor of Nursing Practice (DNP) project proposal. Ms. Nolker obtained approval for her proposal, *Primary Stroke Education Using the ASCVD Risk Calculator and the Stroke Knowledge Test in Primary Care,* from the School of Nursing and Health Studies DNP faculty on July 17, 2019.

If we can provide further information, please feel free to contact us.

Sincerely,

Cheri Barber, DNP, RN, PPCNP-BC, FAANP

Clinical Assistant Professor

DNP Program Director

UMKC School of Nursing and Health Studies

barberch@umkc.edu

Lyla Lindholm, DNP, ACNS-BC

UMKC MSN-DNP Program Coordinator

Clinical Assistant Professor

DNP Faculty

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